

CLAIMS

We claim:

- 1 1. A method comprising:
 - 2 dividing an input image and an output image into blocks, wherein
 - 3 each block in the output image corresponds to one block in the input image;
 - 4 calculating a color average of each input block;
 - 5 calculating a set of output colors for each block in the output image to
 - 6 match the color average of its corresponding block in the input image; and
 - 7 generating an indication to control positioning of the set of output
 - 8 colors in said each block of the output image.
- 1 2. The method defined in Claim 1 further comprising dividing
2 each input and output block into subblocks in response to a certain criteria
3 being met.
- 1 3. The method defined in Claim 2 wherein the criteria for
2 dividing a block into subblocks is whether the block contains an edge.
- 1 4. The method defined in Claim 1 wherein characteristics of the
2 block are such that a human eye averages colors associated with the block.

1 5. The method defined in Claim 4 wherein the characteristics
2 include one or more of size, shape and expected viewing distance.

1 6. The method defined in Claim 1 wherein calculating the set of
2 output colors is performed by examining possible values achievable in a
3 color space and locating an achievable value closest to the color average of
4 the corresponding input block.

1 7. The method defined in Claim 1 wherein calculating the set of
2 output colors comprises using a look-up table on the average color to
3 determine output colors in the set.

1 8. The method defined in Claim 7 wherein the average color
2 distance output color is the set either exactly or approximately.

1 9. The method defined in Claim 1 wherein calculating the set of
2 output colors comprises using integer programming.

1 10. The method defined in Claim 1 wherein calculating the set of
2 output colors comprises using dynamic programming.

1 11. The method defined in Claim 1 wherein calculating the set of
2 output colors comprises using an approximate linear programming solution.

1 12. The method defined in Claim 1 wherein calculating the set of
2 output colors comprises using an approximate maximum entropy solution.

1 13. The method defined in Claim 1 wherein dividing a block into
2 subblocks comprises:

3 calculating a function of the color value for each block and for each of
4 a plurality of subblocks in said each block;
5 determining if the distance between the function of the color value of
6 the block and subblocks is greater than a threshold; and
7 dividing the block into subblocks if the difference is greater than the
8 threshold.

1 14. The method defined in Claim 13 further comprising
2 determining an edge exists by comparing a function of color values for each
3 subblock to the function's value for the other subblocks of the block.

1 15. The method defined in Claim 13 wherein the plurality of
2 subblocks comprises four subblocks.

1 16. The method defined in Claim 1 further comprising positioning
2 colors within each block to match a target color and reduce spatial artifacts
3 given the set of output colors.

1 17. The method defined in Claim 16 wherein tessellating colors
2 within each block comprises performing regular gridding.

3

1 18. The method defined in Claim 16 wherein tessellating colors
2 within each block comprises using a dither matrix ordering of the chosen
3 output colors.

19. An article of manufacture having a recordable medium storing executable instructions which, when executed by a system causes the system to perform the steps of Claim 1.

1 20. An apparatus comprising:
2 a divider to divide an input image and an output image into blocks,
3 wherein each block in the output image corresponds to one block in the
4 input image;
5 first logic to calculate a color average for each input block;
6 second logic to calculate a set of output colors for each block in the
7 output image to match the color average of its corresponding block in the
8 input image; and
9 indication generation logic to generate an indication to control
10 positioning of the set of output colors in said each block of the output image.

1 21. The apparatus defined in Claim 20 wherein the divider divides
2 each input and output block into subblocks in response to a certain criteria
3 being met.

1 22. The apparatus defined in Claim 20 wherein the criteria for
2 dividing a block into subblocks is whether the block contains an edge.

1 23. The apparatus defined in Claim 19 wherein characteristics of
2 the block are such that a human eye averages colors associated with the
3 block.

1 24. The apparatus defined in Claim 23 wherein the characteristics
2 include one or more of size, shape and expected viewing distance.

1 25. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors examines possible values achievable in a
3 color space and locates an achievable value closest to the color average of the
4 corresponding input block.

1 26. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors uses a look-up table on the average color to
3 determine output colors in the set.

1 27. The apparatus defined in Claim 26 wherein the average color
2 distance output color is the set either exactly or approximately.

1 28. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors uses integer programming.

1 29. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors uses dynamic programming.

1 30. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors uses an approximate linear programming
3 solution.

1 31. The apparatus defined in Claim 19 wherein the logic to
2 calculate the set of output colors uses an approximate maximum entropy
3 solution.

1 32. The apparatus defined in Claim 19 further comprises:
2 calculation logic to generate a function of the color value for each
3 block and for each of a plurality of subblocks in said each block;
4 determination logic to determine if the distance between the function
5 of the color value of the block and subblocks is greater than a threshold; and

6 a divider to divide the block into subblocks if the difference is greater
7 than the threshold.

1 33. The apparatus defined in Claim 32 further comprising
2 determination logic to determine an edge exists by comparing a function of
3 color values for each subblock to the function's value for the other subblocks
4 of the block.

1 34. The apparatus defined in Claim 32 wherein the plurality of
2 subblocks comprises four subblocks.

1 35. The apparatus defined in Claim 19 further comprising control
2 logic to position colors within each block to match a target color and reduce
3 spatial artifacts given the set of output colors.

1 36. The apparatus defined in Claim 35 wherein the control logic
2 performs regular gridding within each block.

1 37. The apparatus defined in Claim 36 wherein the control logic
2 performs dither matrix ordering of the chosen output colors within each
3 block.

1 38. An apparatus comprising:

2 means for dividing an input image and an output image into blocks,
3 wherein each block in the output image corresponds to one block in the
4 input image;

5 means for calculating a color average of each input block;
6 means for calculating a set of output colors for each block in the
7 output image to match the color average of its corresponding block in the
8 input image; and

9 means for generating an indication to control positioning of the set of
10 output colors in said each block of the output image.

11

1 39. A method comprising:

2 dividing the input image and the output image into blocks comprises
3 adaptively sizing blocks with edges to create a plurality of blocks without
4 edges; and

5 computing a set of output colors that best renders a color average of
6 the input image for the corresponding block.

1 40. The method defined in Claim 39 wherein the input image's
2 color gamut is pre-warped to adjust for the output color gamut.

1 41. An apparatus comprising:

2 means for dividing the input image and the output image into blocks
3 comprises means for adaptively sizing blocks with edges to create a plurality
4 of blocks without edges; and
5 means for computing a set of output colors that best renders a color
6 average of the input image for the corresponding block.

1 42. The apparatus defined in Claim 39 wherein the input image's
2 color gamut is pre-warped to adjust for the output color gamut.

1 43. An apparatus comprising:
2 a divider to divide the input image and the output image into blocks
3 by means for adaptively sizing blocks with edges to create a plurality of
4 blocks without edges; and
5 computation logic to compute a set of output colors that best renders
6 a color average of the input image for the corresponding block.

PCT/US2014/036268